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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/519,469	12/27/2004	Seung-Woo Kim	2400/2	2679

27774 7590 06/14/2007

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EXAMINER	
RICHEY, SCOTT M	

ART UNIT	PAPER NUMBER
2877	

MAIL DATE	DELIVERY MODE
06/14/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/519,469	KIM ET AL.	
	Examiner	Art Unit	
	Scott M. Richey	2877	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 April 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *8-14* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *8-14* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *27 December 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☒ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *8/18/2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Oath/Declaration

The oath or declaration is defective. A new oath or declaration in compliance with 37 CFR 1.67(a) identifying this application by the application number and filing date is required. See MPEP §§ 602.01 and 602.02. The oath or declaration is defective because it does not identify the citizenship of each inventor.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

Claims 8 and 14 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The claims state, "an optical interferometer coupled to receive a first portion of the light beam." It is unclear what light is contained in the first portion: is it one or two frequencies, is it one or two polarizations, or is it some combination? The claims state that an optical interferometer generates "a measured signal." It cannot be determined if the interferometer somehow measures the "first portion" generating the measured signal, or if an unclaimed measuring device measures the light received by the interferometer. The claims state the limitation, "the remaining portion of the light beam." There is insufficient antecedent basis for this limitation in the claim. It cannot be ascertain from the claim as set forth where or how the beam is

divided into portions. Further, the claimed "first portion" is incident on the interferometer, which implies that a *remaining portion* would be created before the interferometer. So, it is unclear how the reference light could be based on this remaining portion. It is also unclear what light is contained in the first portion: is it one or two frequencies, is it one or two polarizations, or is it some combination?

Several clauses within the claims cannot be given patentable weight because it has been held that the recitation that an element is "capable of" performing, or is "adapted," "configured," etc. to perform a function is not a positive limitation but only requires the ability to so perform. It does not constitute a limitation in any patentable sense. See, *In re Hutchison, 69 USPQ 138.* For example, "for generating a light beam," "configured to adjust the frequencies," and "for measuring a phase" cannot be given patentable weight.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claim 8 is rejected under 35 U.S.C. 102(b) as being anticipated by Kuchel (US 5,054,912).

Kuchel discloses a heterodyne laser interferometer in Fig.1, comprising: a heterogeneous mode helium-neon laser light source for generating a light beam having

two frequency components that are linearly polarized and perpendicular to one another (1, 2); an optical interferometer coupled to receive a first portion of the light beam from the laser light source and to generate a measured signal (entire figure); a frequency converter coupled to receive the measured signal and a reference signal that is based on the remaining portion of the light beam (36, 37), said frequency converter configured to adjust the frequencies of the measured signal and the reference signal without adjusting their relative phase; and a superheterodyne phase measurer coupled to the frequency converter for measuring a phase of the frequency converted measured signal and the frequency converted reference signal (38).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

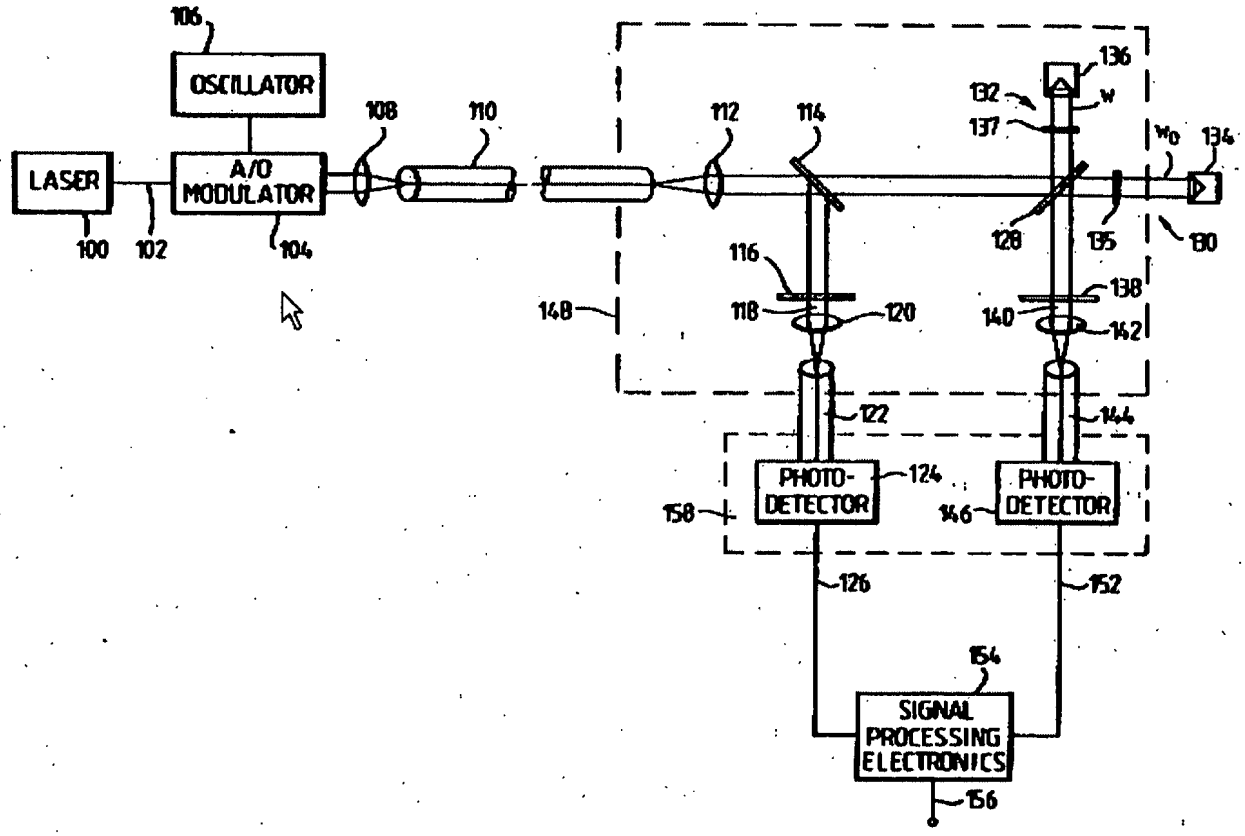
1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 9-12, and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chaney (US 5,274,436) in view of Xu et al. (US 5,796,482) hereinafter Xu.

As to claim 9, Chaney teaches a heterodyne laser interferometer, comprising: a heterogeneous mode helium-neon laser light source for generating a light beam having two frequency components that are linearly polarized and perpendicular to one another; an optical interferometer coupled to receive a first portion of the light beam from the laser light source and to generate a measured signal; a frequency converter coupled to receive the measured signal and a reference signal that is based on the remaining portion of the light beam, said frequency converter configured to adjust the frequencies of the measured signal and the reference signal without adjusting their relative phase; a polarizer coupled to receive said remaining portion of the light beam, the polarizer having a polarization axis that is titled at 45° relative to the two frequency components of the light beam; a photodetector coupled to receive light from the polarizer and in

response thereto generate an electrical reference signal represented by $V_r = A\cos[2\pi(f_1 - f_2)t]$ where V_r is the electrical reference signal, A is the amplitude of the electrical reference signal, and f_1 and f_2 are frequency components included in the light beam.



Chaney is silent to the method step converting the light into an electronic signal characterized by the equation of claim 9. However, the electrical signals 126 and 152 created by the optical detectors 124 and 146 can be characterized be the equation of claim 9. While the apparatus of Chaney appears to comprise superheterodyne detection, the reference is silent to it.

Xu teaches the apparatus comprising a superheterodyne phase measurer coupled to the frequency converter for measuring a phase of the frequency converted measured signal and the frequency converted reference signal, "to remove noise" (col.2, ln.11-23). It would have been obvious to one of ordinary skill in the art at the time of invention to incorporate the superheterodyne components (Xu's elements 9-13) within the device of Chaney (i.e., in place of Chaney's element 154) to achieve less noise.

As to claim 10, Chaney teaches the apparatus wherein the optical interferometer comprises: a polarization splitter (128) for splitting the light beam into a first of the two frequency components and a second of the two frequency components; a fixed reflecting mirror (136) for receiving the first frequency component; a movable reflecting mirror (134) for receiving the second frequency component; a polarization combiner (128, 135, 137, 138) for combining the first frequency component reflected by the fixed reflecting mirror with the second frequency component reflected by the movable reflecting mirror, said polarization combiner having a polarization axis that is rifled at 45° relative to the two frequency components of the light beam (138), and a photodetector (146) for receiving combined light from the polarization combiner and in response generating the measured signal as an electrical signal, wherein the electrical signal is represented by $V_m = B\cos\left\{2\pi(f_1 - f_2)t + \frac{2nd_1}{\lambda_1} - \frac{2nd_2}{\lambda_2}\right\}$ where V_m is the measured signal, B is the amplitude of the signal, λ_1 and λ_2 are wavelengths of the light having the first and second frequency components, respectively, d_1 is a distance that

the first frequency component has traveled in air, d_2 is a distance that the second frequency component has traveled in air, and n is the refractive index of air. While Chaney is silent as to the method step of converting the light signal into the electronic signal characterized by the equation of claim 10, the structural components, which convert the optical signals into electronic signals, produce a signal that can be characterized by the equation.

As to claim 11, Xu teaches the apparatus in Fig.1 wherein the frequency converter comprises: a local oscillator (11) for generating a local signal approximately equal to a beat frequency of the reference signal; a signal splitter (wires between 11 and 10) for splitting the local signal into first and second local signals; first and second mixers (10m, 10r) for multiplying the reference signal with the first and second local signals respectively to provide first and second output signals, respectively; a first filter (12m) for eliminating from the first output signal a signal corresponding to the sum of the reference signal and the first local signal; a second filter (12r) for eliminating from the second output signal a signal corresponding to the sum of the reference signal and the second local signal, whereby the phase measurer receives third and fourth signals passing through the first and second filters, respectively (13) "to remove noise."

It would have been obvious to one of ordinary skill in the art at the time of invention to incorporate the frequency converter within the device of Chaney to achieve less noise.

As to claim 12, Xu teaches the apparatus wherein the third signal is represented by $V_m' = A\cos(2\pi ft)$ and the fourth signal is represented by

$V'_m = B\cos\left\{2\pi\left(ft + \frac{2nd_1}{\lambda_1} - \frac{2nd_2}{\lambda_2}\right)\right\}$ where $f = f_1 - f_2 - f_{LO}$, f_{LO} is the frequency of a local oscillation signal, f_1 and f_2 are the first and second frequency components, respectively, λ_1 and λ_2 are wavelengths of the light having the first and second frequency components, respectively, d_1 is a distance that the first frequency component has traveled in air, d_2 is a distance that the second frequency component has traveled in air, and n is the refractive index of air to remove noise.

It would have been obvious to one of ordinary skill in the art at the time of invention to incorporate the frequency converter within the device of Chaney to achieve less noise.

As to claim 14, Chaney teaches a heterodyne laser interferometer, comprising: a heterogeneous mode laser light source for generating a light beam having two frequency components that are linearly polarized and perpendicular to one another (100, 102, 104, 106); an optical interferometer coupled to receive a first portion of the light beam from the laser light source and to generate a measured signal (128, 134, 136); and a superheterodyne phase measurer (154); a polarizer coupled to receive said remaining portion of the light beam, the polarizer having a polarization axis that is titled at 45° relative to the two frequency components of the light beam (116); a photodetector coupled to receive light from the polarizer and in response thereto generate an electrical reference signal (124); wherein the optical interferometer comprises: a polarization splitter for splitting the light beam into a first of the two frequency components and a second of the two frequency components (128); a fixed reflecting mirror for receiving the

first frequency component (136); a movable reflecting mirror for receiving the second frequency component (134); a polarization combiner for combining the first frequency component reflected by the fixed reflecting mirror with the second frequency component reflected by the movable reflecting mirror, said polarization combiner having a polarization axis that is titled at 45° relative to the two frequency components of the light beam (128, 138); and a photodetector for receiving combined light from the polarization combiner and in response generating the measured signal as an electrical signal (146).

Chaney is silent to the laser source being a helium-neon laser. It is well known to use a HeNe source, as they are inexpensive. For example, see Bowen et al. It would have been obvious to one of ordinary skill in the art at the time of invention to use a HeNe laser for generating the laser light of Chaney's interferometer to save money.

Chaney is silent to the interferometer comprising a frequency converter, wherein the frequency converter comprises: a local oscillator for generating a local signal approximately equal to a beat frequency of the reference signal; a signal splitter for splitting the local signal into first and second local signals; first and second mixers for multiplying the reference signal with the first and second local signals respectively to provide first and second output signals, respectively; a first filler for eliminating from the first output signal a signal corresponding to the sum of the reference signal and the first local signal; a second filter for eliminating from the second output signal a signal corresponding to the sum of the reference signal and the second local signal, whereby the phase measurer receives third and fourth signals passing through the first and second filters, respectively.

Xu teaches the interferometer, comprising a frequency converter in Fig.1, wherein the frequency converter comprises: a local oscillator for generating a local signal approximately equal to a beat frequency of the reference signal; a signal splitter for splitting the local signal into first and second local signals; first and second mixers for multiplying the reference signal with the first and second local signals respectively to provide first and second output signals, respectively; a first filler for eliminating from the first output signal a signal corresponding to the sum of the reference signal and the first local signal; a second filter for eliminating from the second output signal a signal corresponding to the sum of the reference signal and the second local signal, whereby the phase measurer receives third and fourth signals passing through the first and second filters, respectively. Xu's superheterodyne detection device incorporates these features "to remove noise" (col.2, ln.11-23).

It would have been obvious to one of ordinary skill in the art at the time of invention to incorporate the superheterodyne components (Xu's elements 9-13) within the device of Chaney (i.e., in place of Chaney's element 154) to achieve less noise.

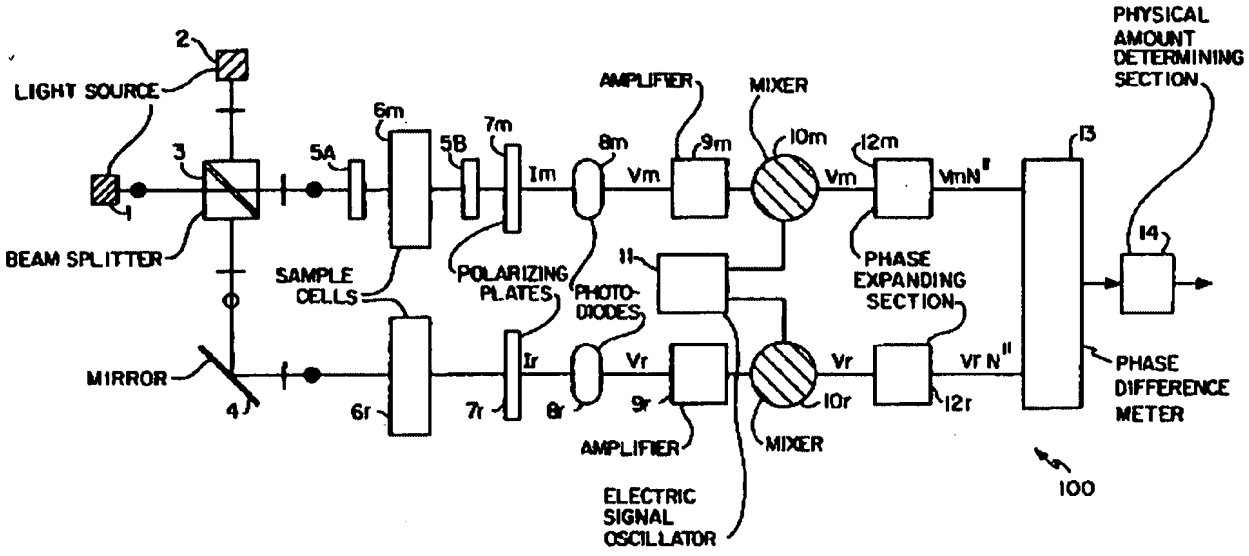


Fig. 1

Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chaney in view of Xu, as applied to claim 10 above, in further view of Matsumoto et al. (US 5,818,588) hereinafter "Matsumoto."

The combined references are silent to the detector comprising a signal splitter.

Matsumoto teaches the heterodyne laser interferometer in Fig.6 further comprising: a signal splitter for splitting the measured electrical signal into first and second split signals; a first mixer for multiplying the first split signal by a local oscillation signal having a frequency f_b+f to produce a third signal; a second mixer for multiplying the second split signal by a local oscillation signal having a frequency f_b-f to produce a fourth signal; a first filter for eliminating radio frequency components from the third signal to generate a fifth signal having a frequency $f+\Delta f$; a second filter for eliminating

radio frequency components from the fourth signal to generate a sixth signal having a frequency *f-Δf*, and wherein the phase measurer is configured to use the fifth signal when a Doppler frequency is positive and the sixth signal when the Doppler frequency is negative to reduce error (col.3, ln.59).

It would have been obvious to one of ordinary skill in the art at the time of invention to include the balanced detection detector within the combined interferometer of Chaney and Xu to reduce error.

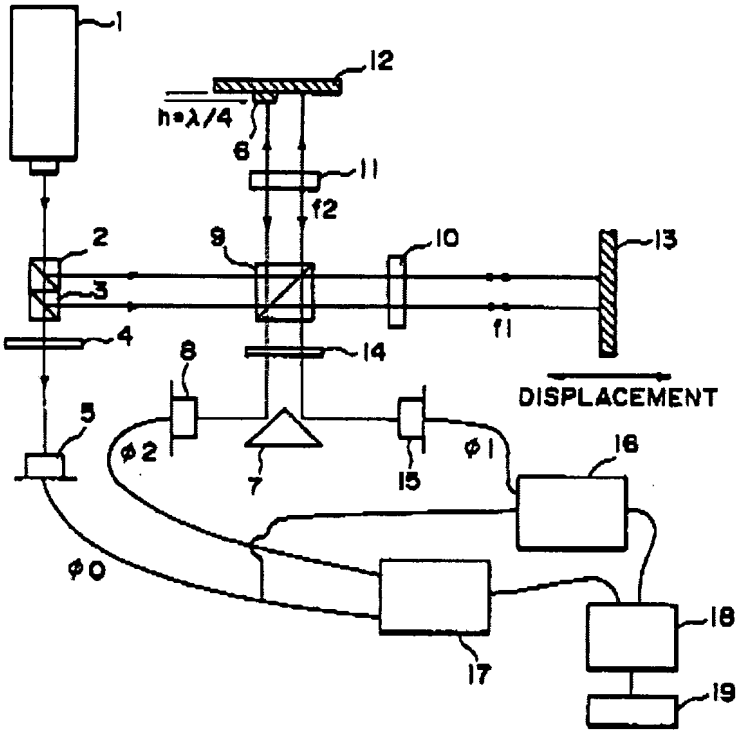


FIG. 6

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Scott M. Richey whose telephone number is (571) 270-1296. The examiner can normally be reached on Monday - Thursday, 10:00 - 17:00 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory Toatley can be reached on (571) 272-2059. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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Patent Examiner
Art Unit 2877

Gregory J. Toatley, Jr.
Supervisory Patent Examiner